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Past and Future – Data Collection Technologies to Provide Precise Data for GeoBIM and Smart Cities

BIM & Smart Cities need

- **Information and data management**
- **Medium to High resolution geometry**
  - Medium to high absolute accuracy
  - High Relative accuracy
- **Most Recent Data**
  - Fast & repeatable data acquisition
- **Comprehensive Data**
  - Combination of technologies to cover every area of interest

Data Collection in the Past

- **Single point measuring (Key points) with surveying instruments**
  - Slow, expensive, sometimes dangerous
- **Orthophoto interpretation for 2D**
  - Relatively cheap, no height, no data under vegetation
- **Stereo-photo processing for 3D**
  - Relatively cheap, no facades, no data under covered area
- **Attributes can be collected on the field only**
  - Aimed data collection, but only aimed attributes collected, hard to collect geometric attributes (trunk diameter, clearance, etc.)

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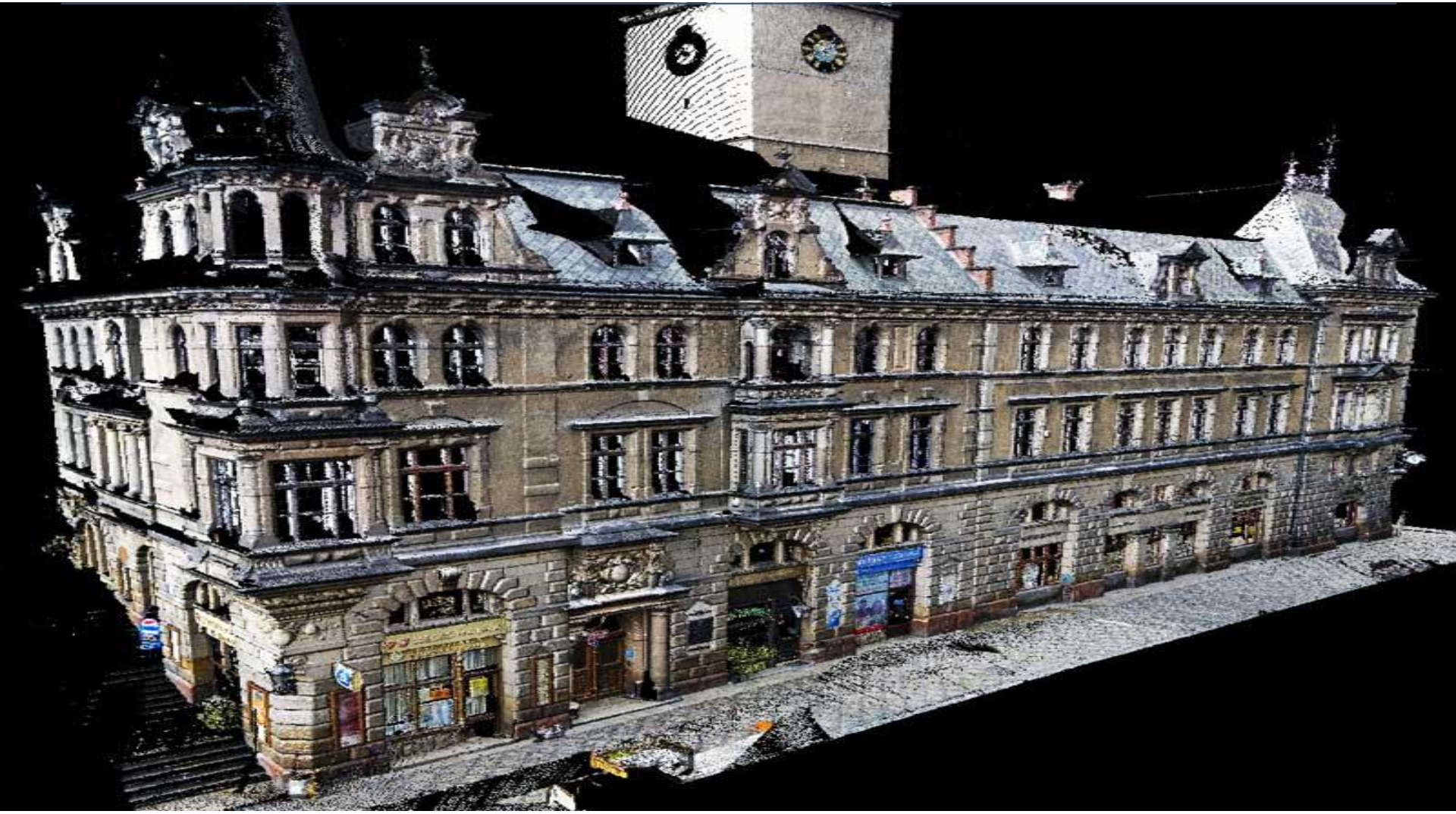

The future has started:

3D point cloud technology can support BIM & Smart Cities

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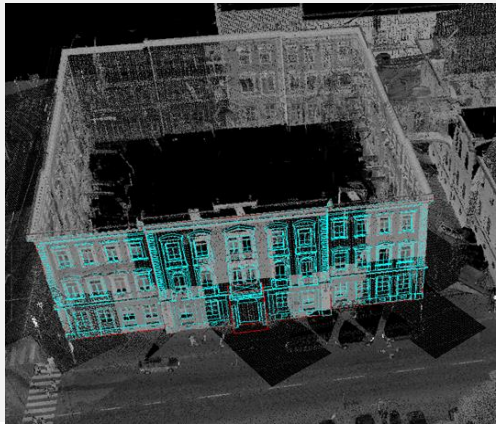
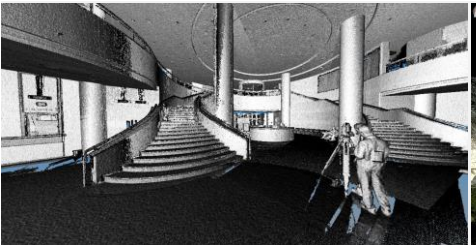
What 3D point cloud offer: Measurable 3D reality

Precisely measurable & digitalized 3D reality (accuracy = even 1 centimeter)

Flexible and efficient GIS data management

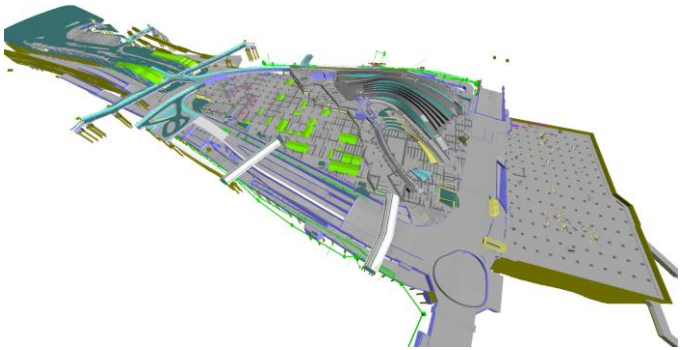




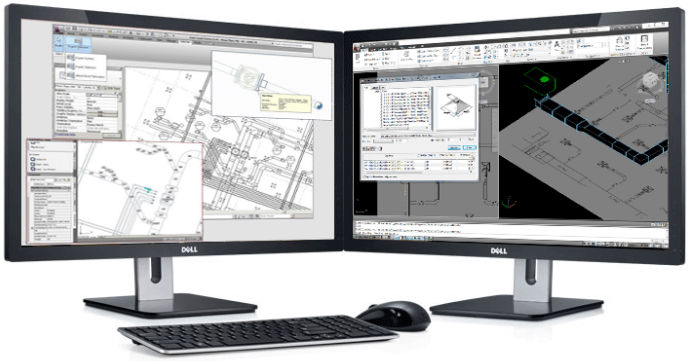
Merging GIS data from different sources

What 3D point cloud offer: Measurable 3D reality

The 3D point cloud technology has added value to support BIM by:



Providing accurate GIS database quickly, with no traffic limitation and with high cost efficiency and on this way, supporting ROI of BIM & Smart City projects



Ensuring efficient data management according any kind of customer needs.

3D point cloud creation – Why Mobile Laser Scanning (MMS)?

The most efficient solutions to provide 3D point cloud GIS data

- **Complexity:** Surveys everything in 360° angle
- **Accuracy:** even 1 centimeter
- **Cost and time efficiency:** 1-10% of field surveying time vs. traditional solutions
- **Flexible usage:** No traffic limitations
- **Re-processable:** according to different needs
- Additional information:
  Geometry and geo-tagged pictures

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3D point cloud - Everywhere

Solutions to provide high resolution everywhere

Under Surface

- Under ground
- Under water

On surface

- Outside (on road, on railway, on water, pedestrian)
- Inside the building

Above surface from the air

- UAV (drone)
- Airborne LIDAR

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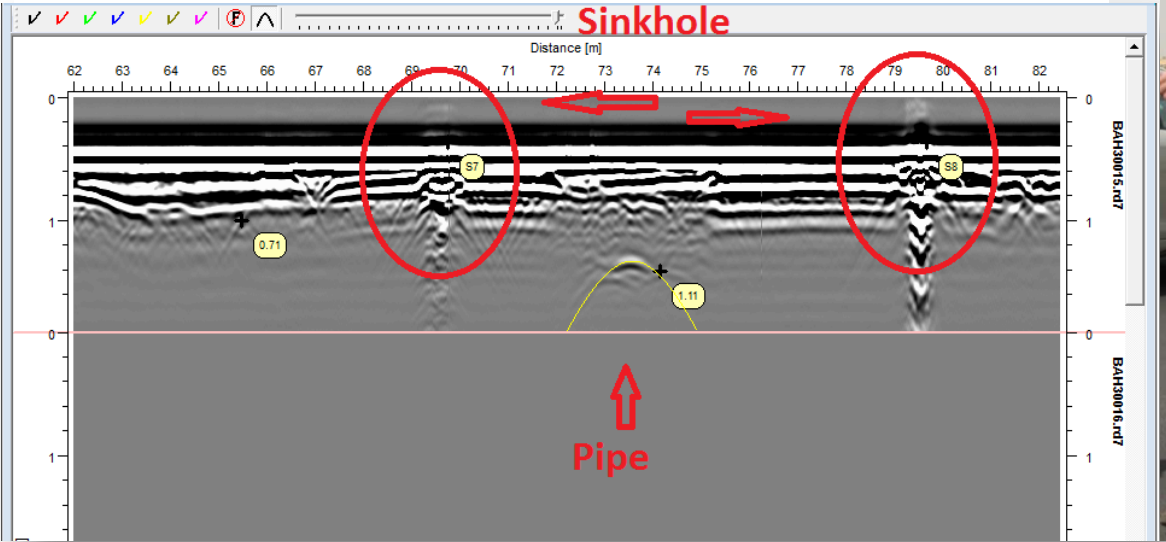
Surveyors can provide data efficiently for a complete City BIM

3D point cloud and GeoBIM - Under surface

Under solid surface

- Utility locators (metallic pipes, cables)
- Ground Penetrating Radar (GPR)

- These techniques can complement surface data (but provide only discrete positions)



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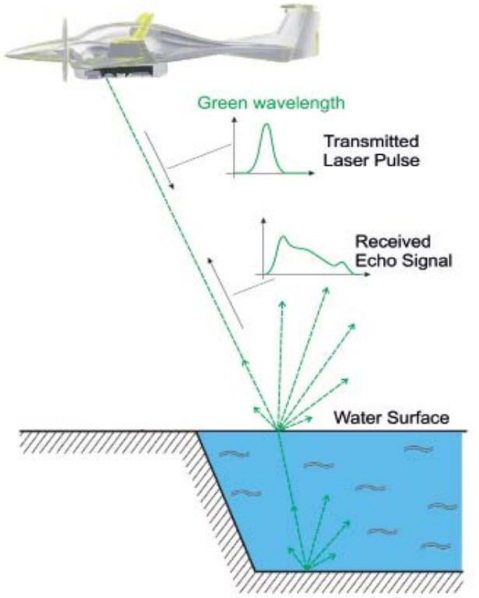
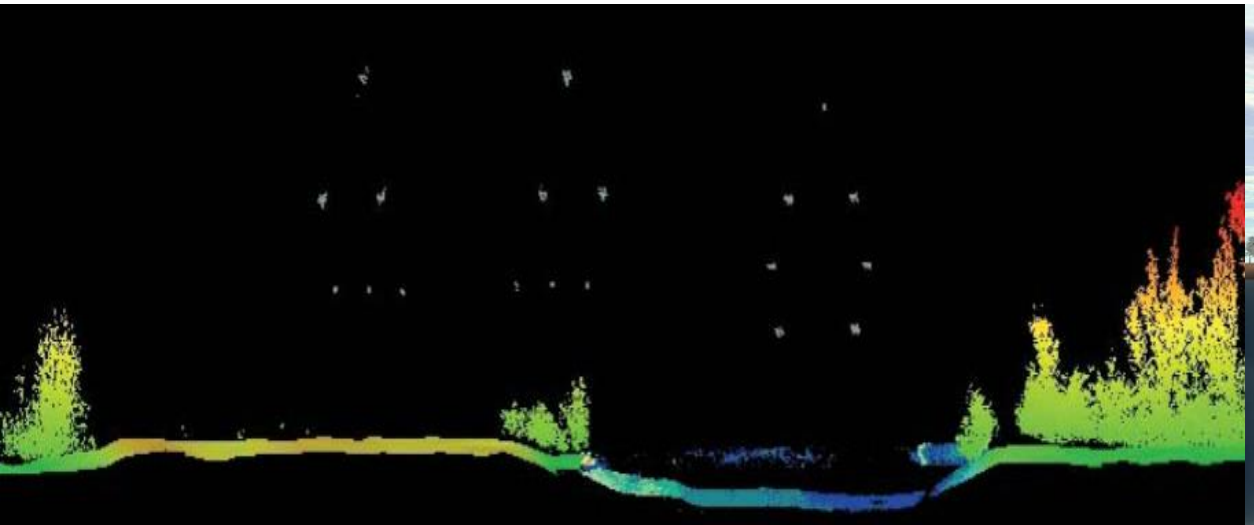
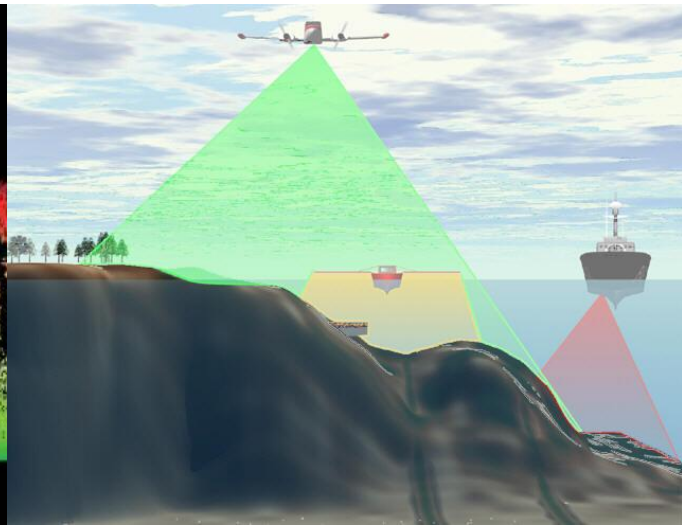
3D point cloud - Under surface

Under water

- Green Laser aerial-scanning (4-10 m depth)
- Ultra-sound depth profiling







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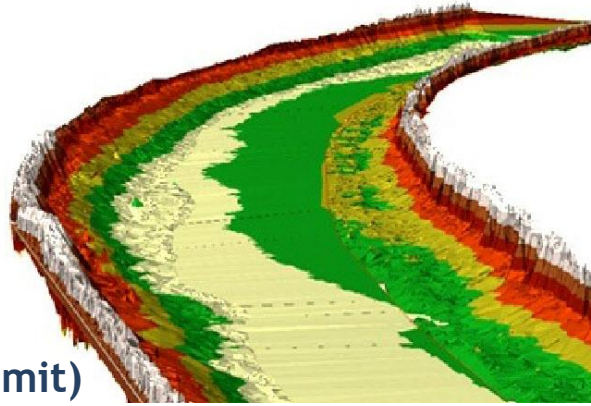
3D point cloud - Under surface



Under water

- Green Laser aerial-scanning (up to 4-10 m)
- **Ultra-sound depth profiling (almost no depth limit)**

- Single beam echo/sounder
- Multi-beam
- Single frequency
- Dual frequency
- Profiling (side looking)
- Manned/Unmanned

On Surface - Outside

- **Mobile Mapping**
  - Traffic network, railways and roads
  - Facades
  - Group of buildings
  - Complete cities or countries

- Terrestrial Scanning

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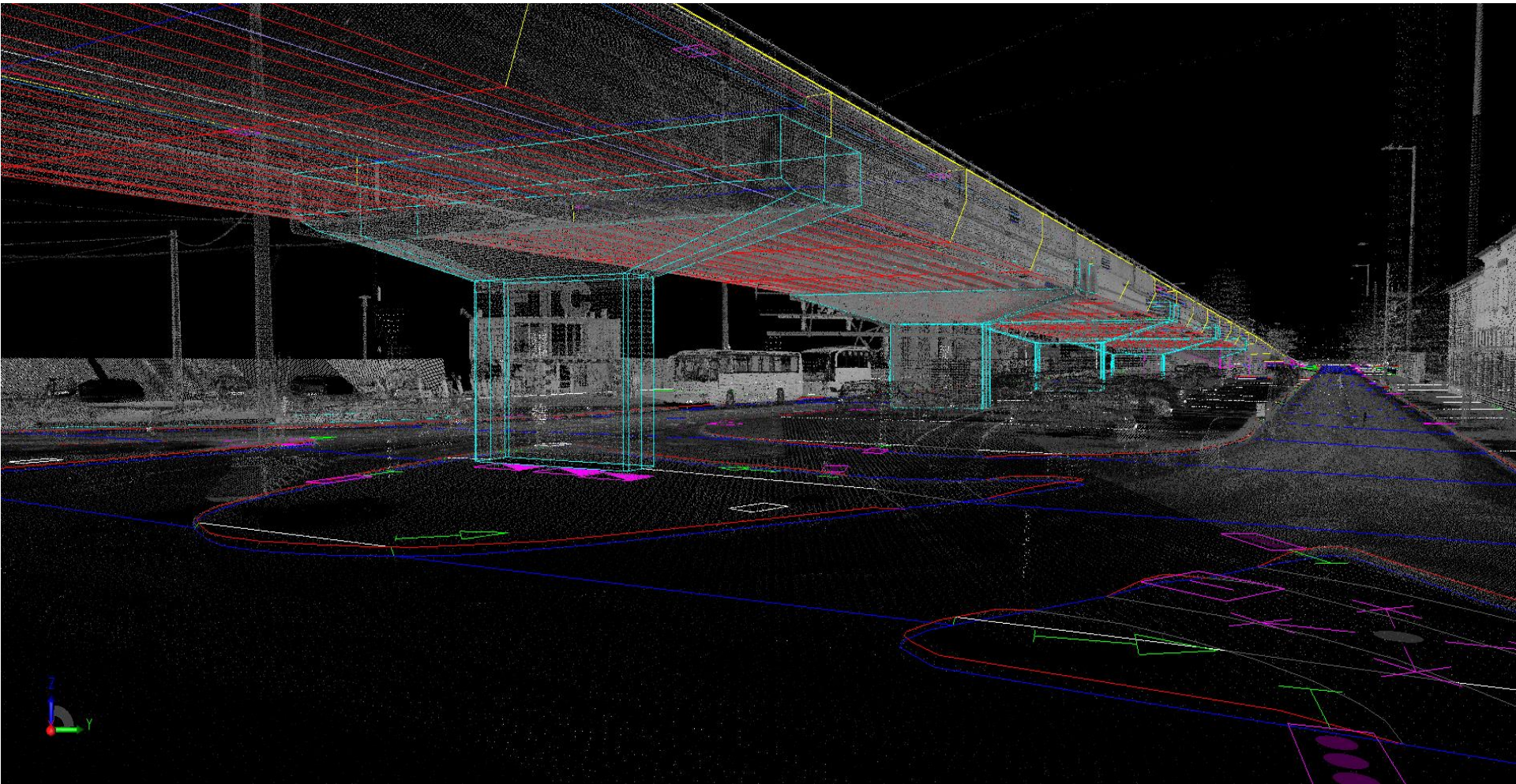
3D point cloud - On Surface - Outside



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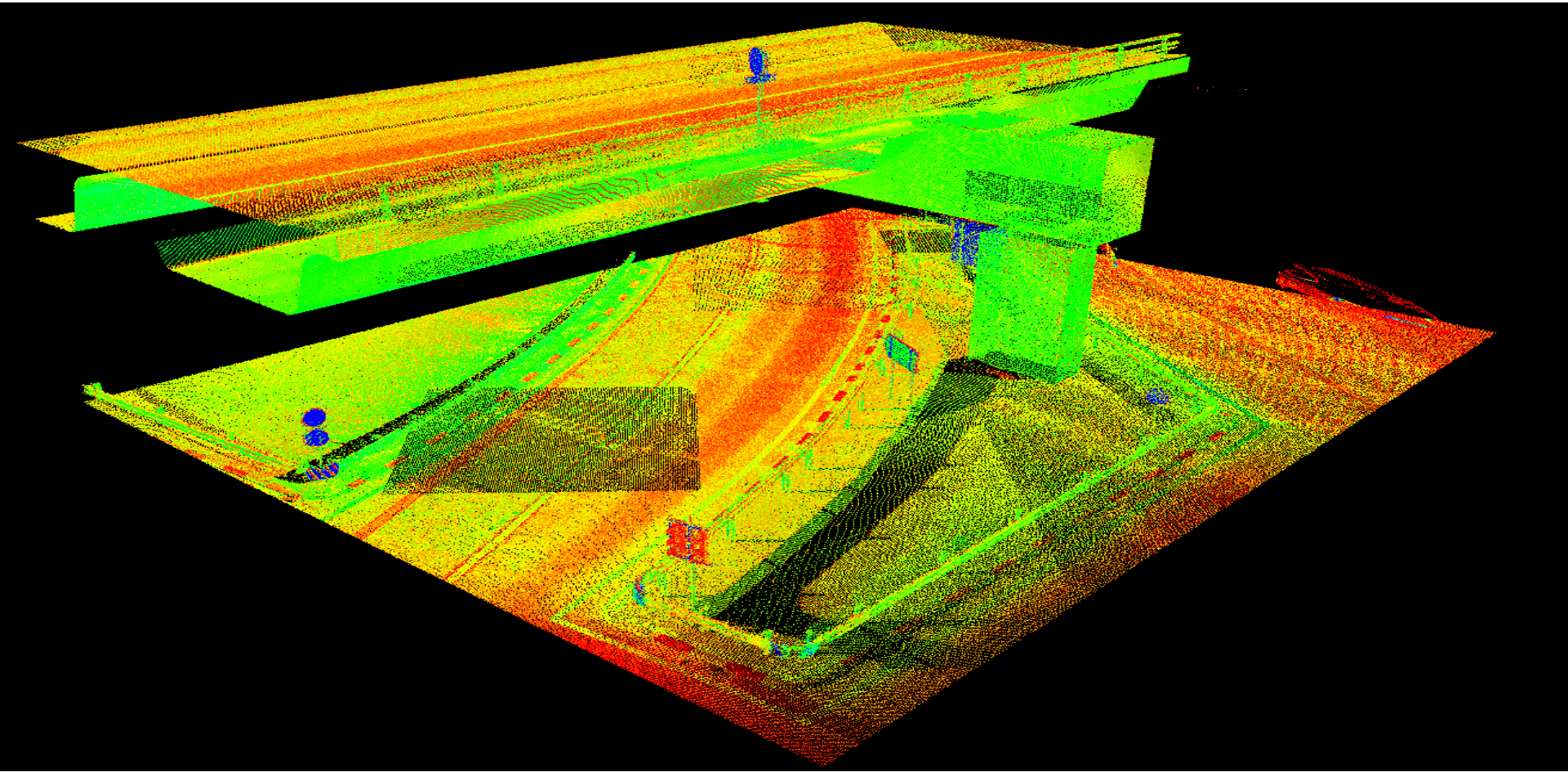
3D point cloud - On Surface - Outside

Highway Junction Overpass



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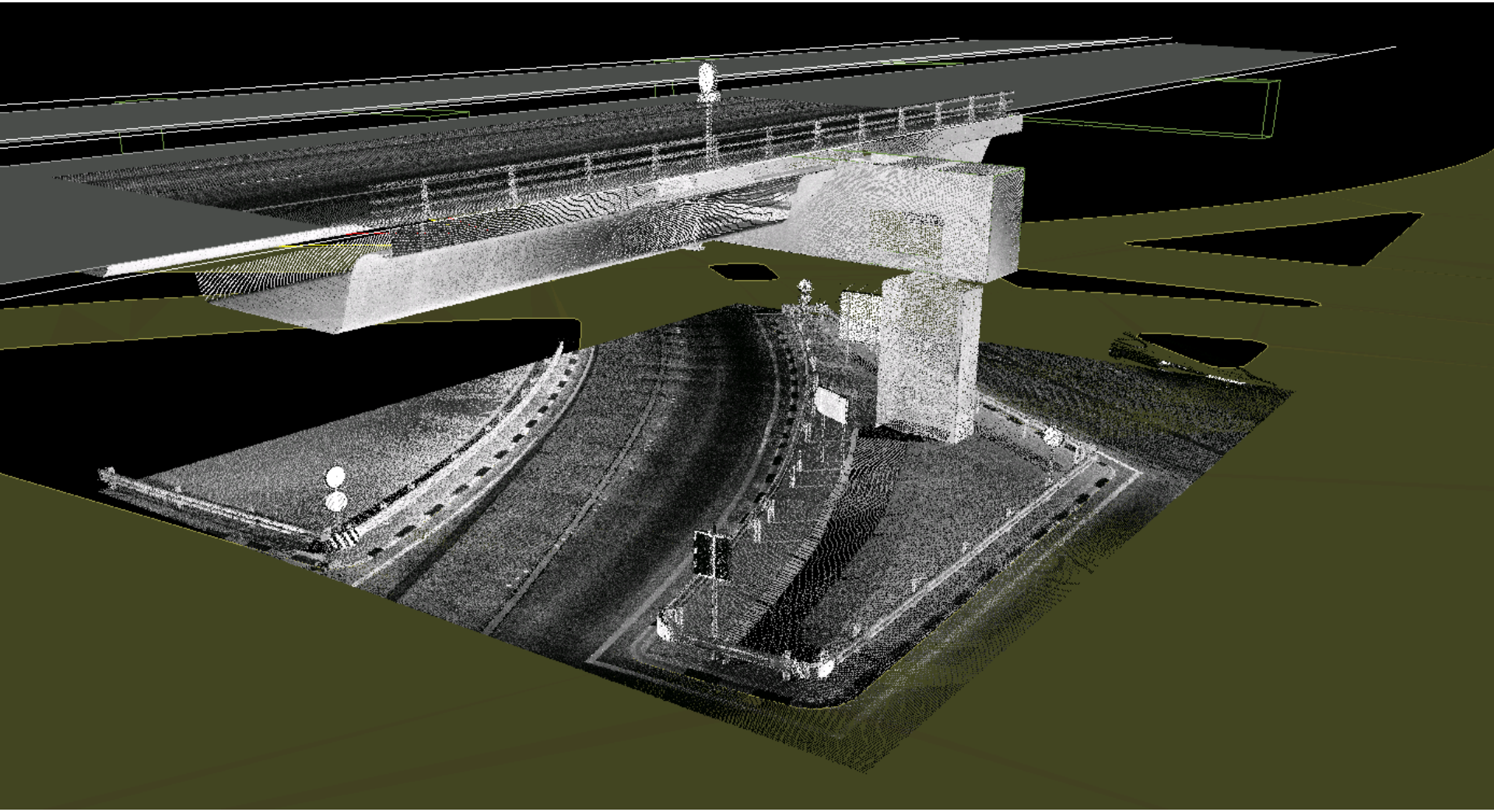
3D point cloud - On Surface - Outside

Highway Junction Overpass



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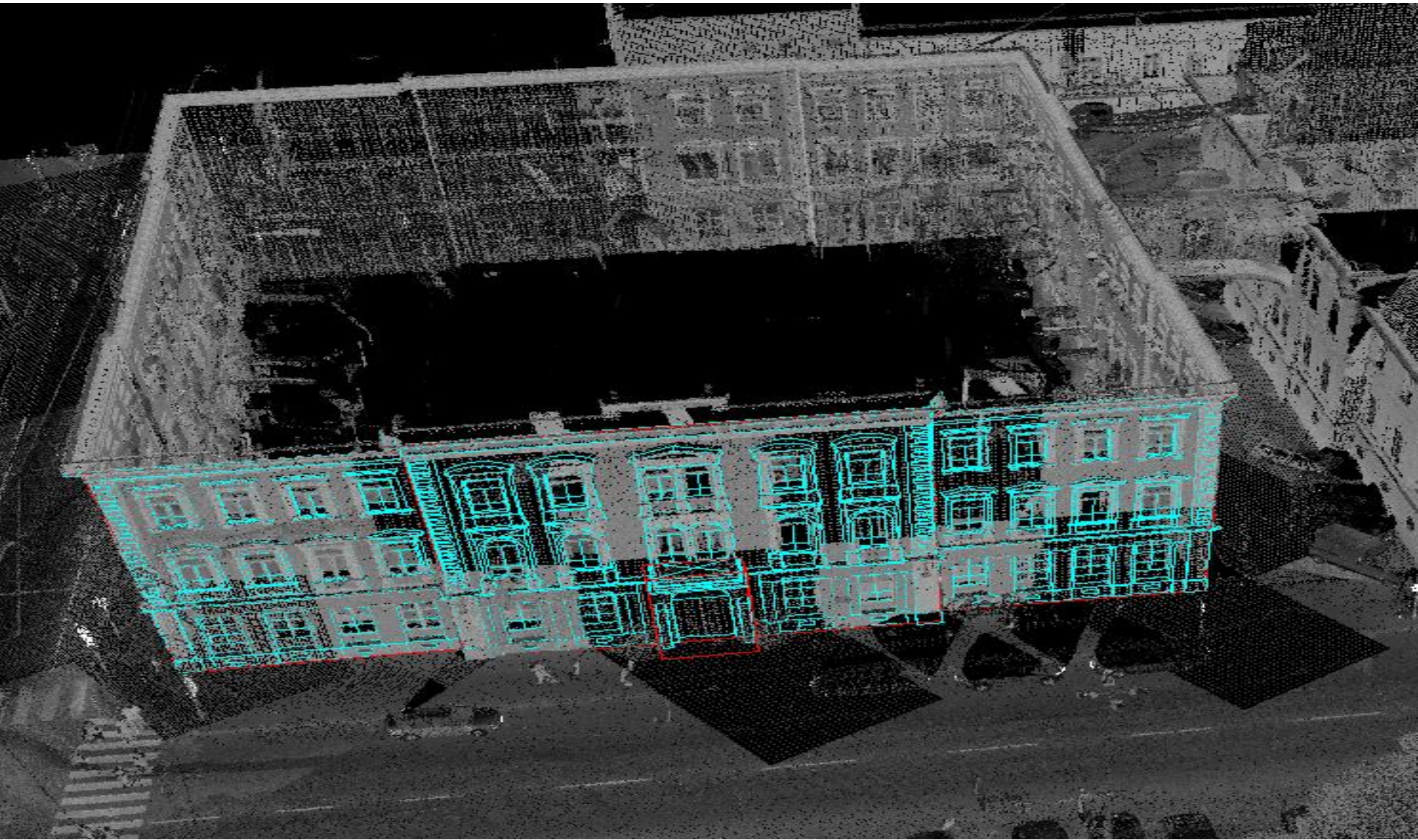
3D point cloud - On Surface - Outside

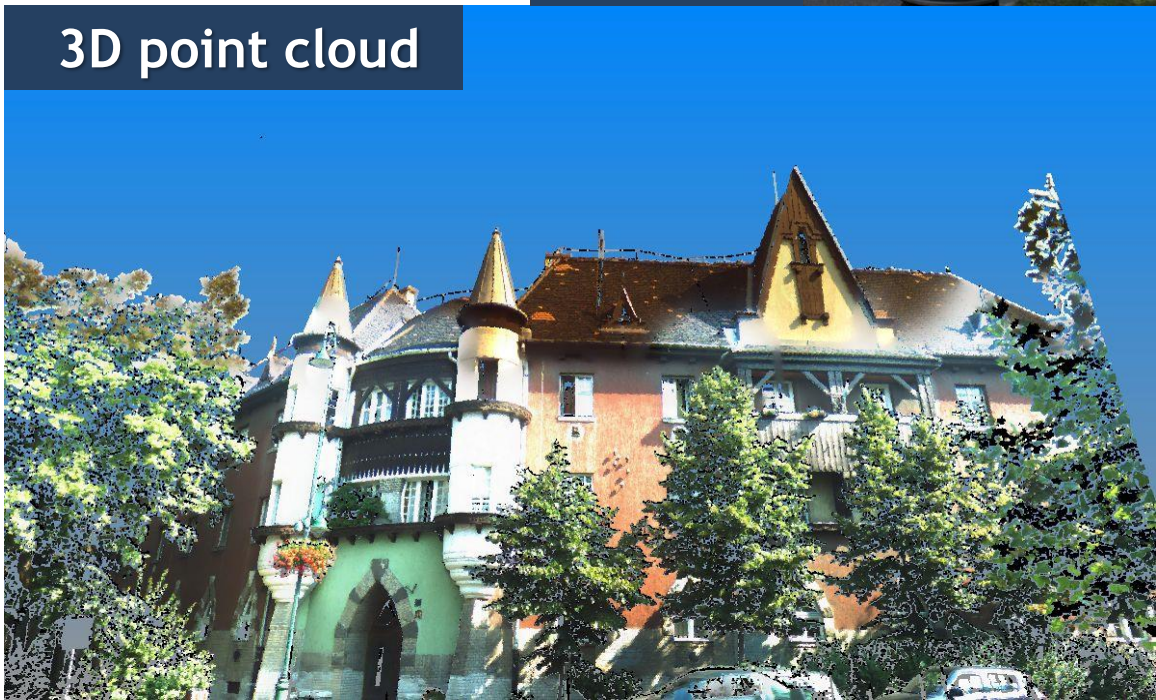


On Surface - Outside

- Mobile Mapping
  - Traffic network
  - Facades
- **Terrestrial Scanning**
  - **Standalone objects**
  - **Heritage buildings**

Picture

3D point cloud



On Surface - Inside

- **Terrestrial Scanning**
  - **Interior details** (furniture level)
  - **Inner Facades, Quadrangles**

- Backpack Solutions
  - Difficult room layout
  - Passages, corridors
  - Narrow areas

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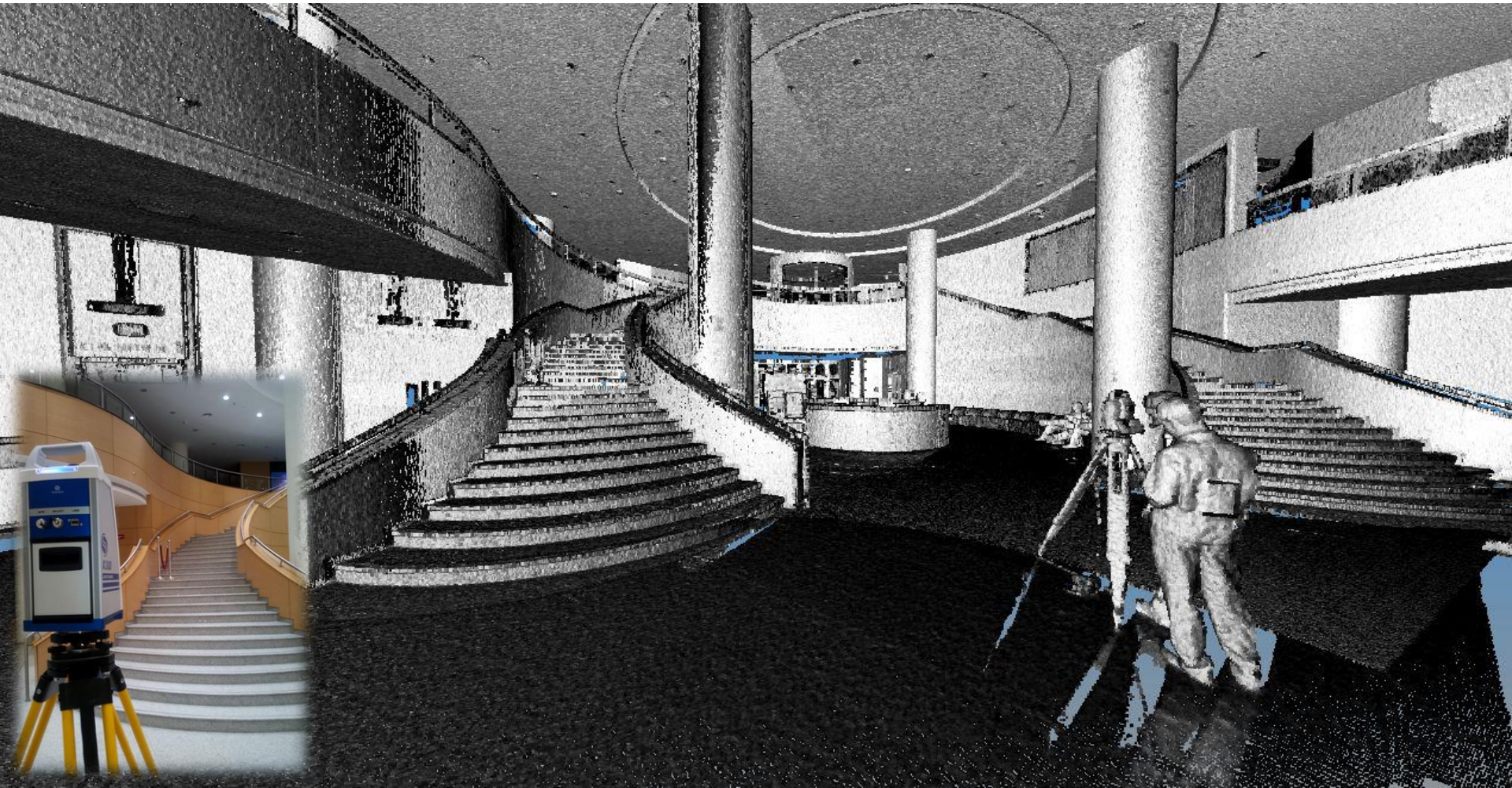
3D point cloud - On Surface - Inside



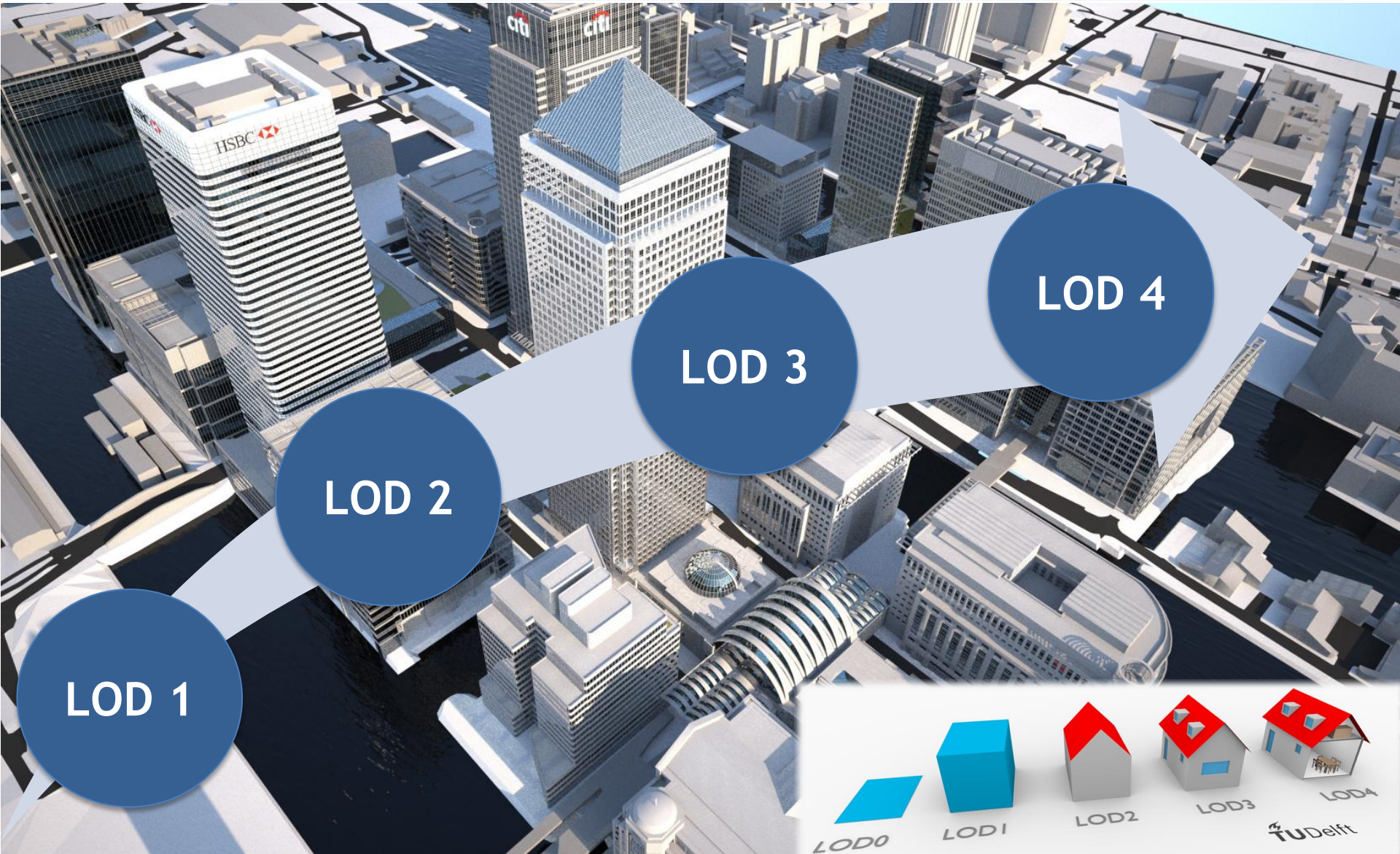
On Surface - Inside

- Terrestrial Scanning
  - Interior details (furniture level)
  - Inner Facades, Quadrangles

- **Backpack Solutions (Leica)**
  - **Difficult room layouts**
  - **Passages, corridors**
  - **Narrow areas**

Measuring in difficult or crowded areas is not a problem

Measuring in details with high accuracy



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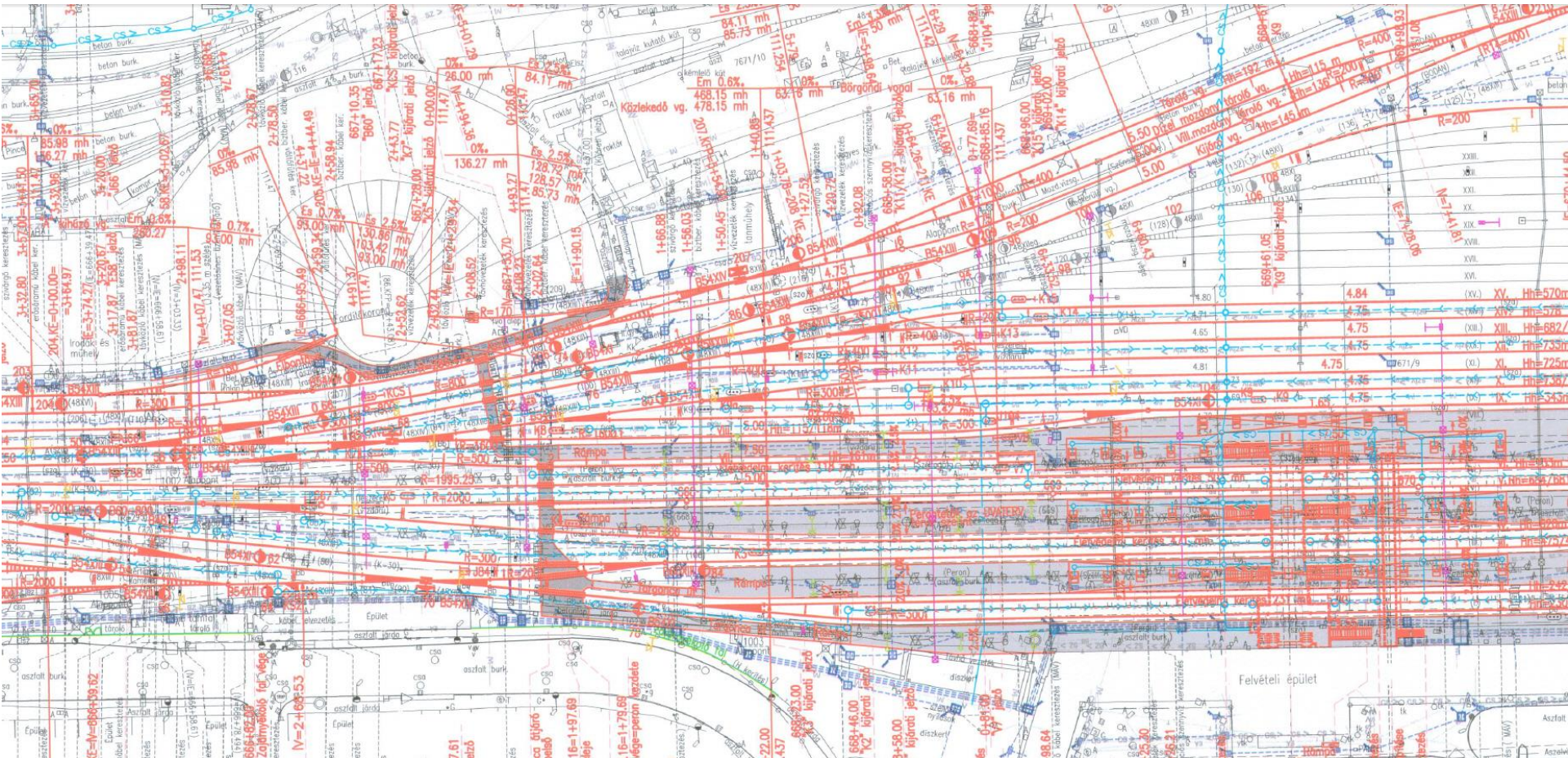
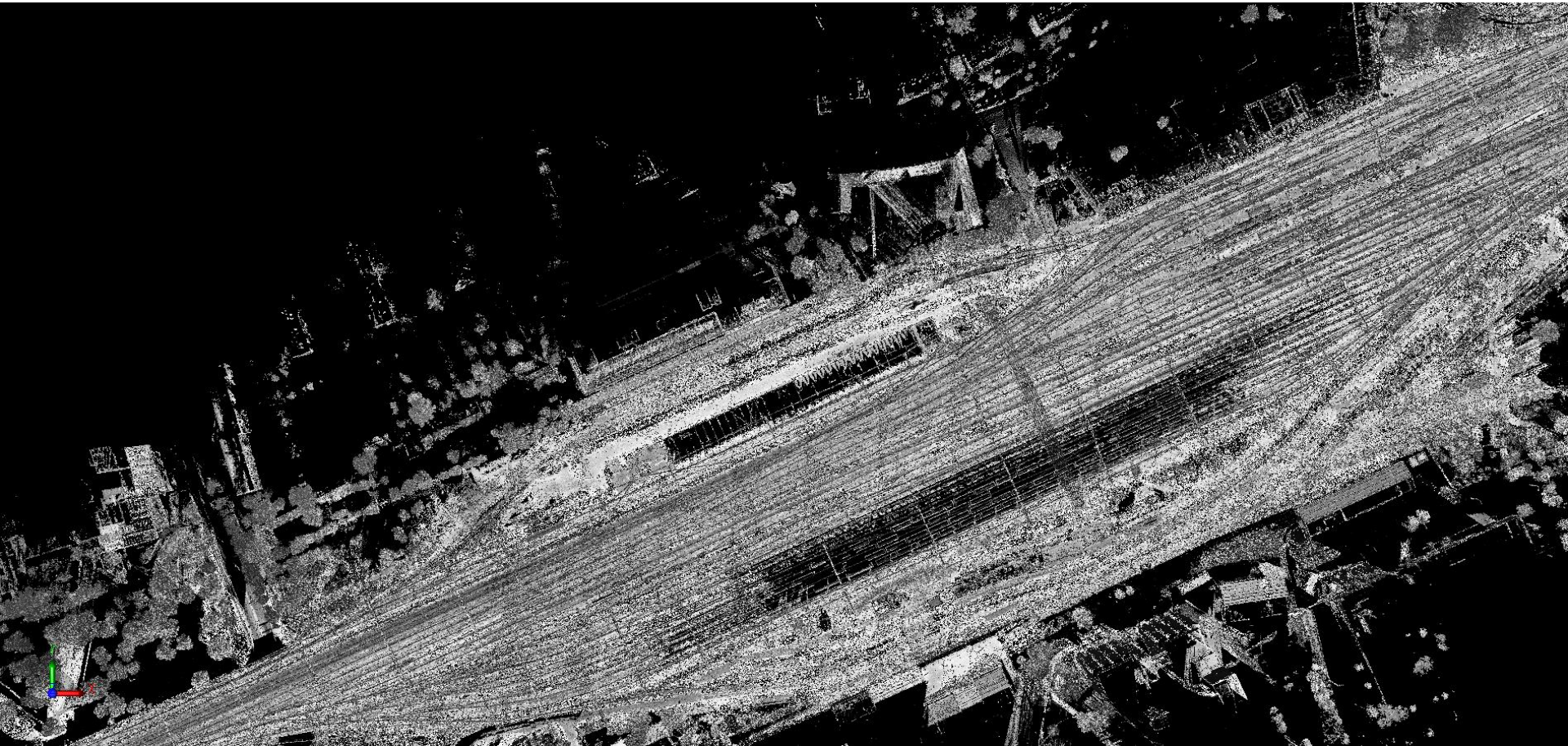
Railway mapping – Overhead cable system

Very difficult systems can be easily surveyed



…and data processed



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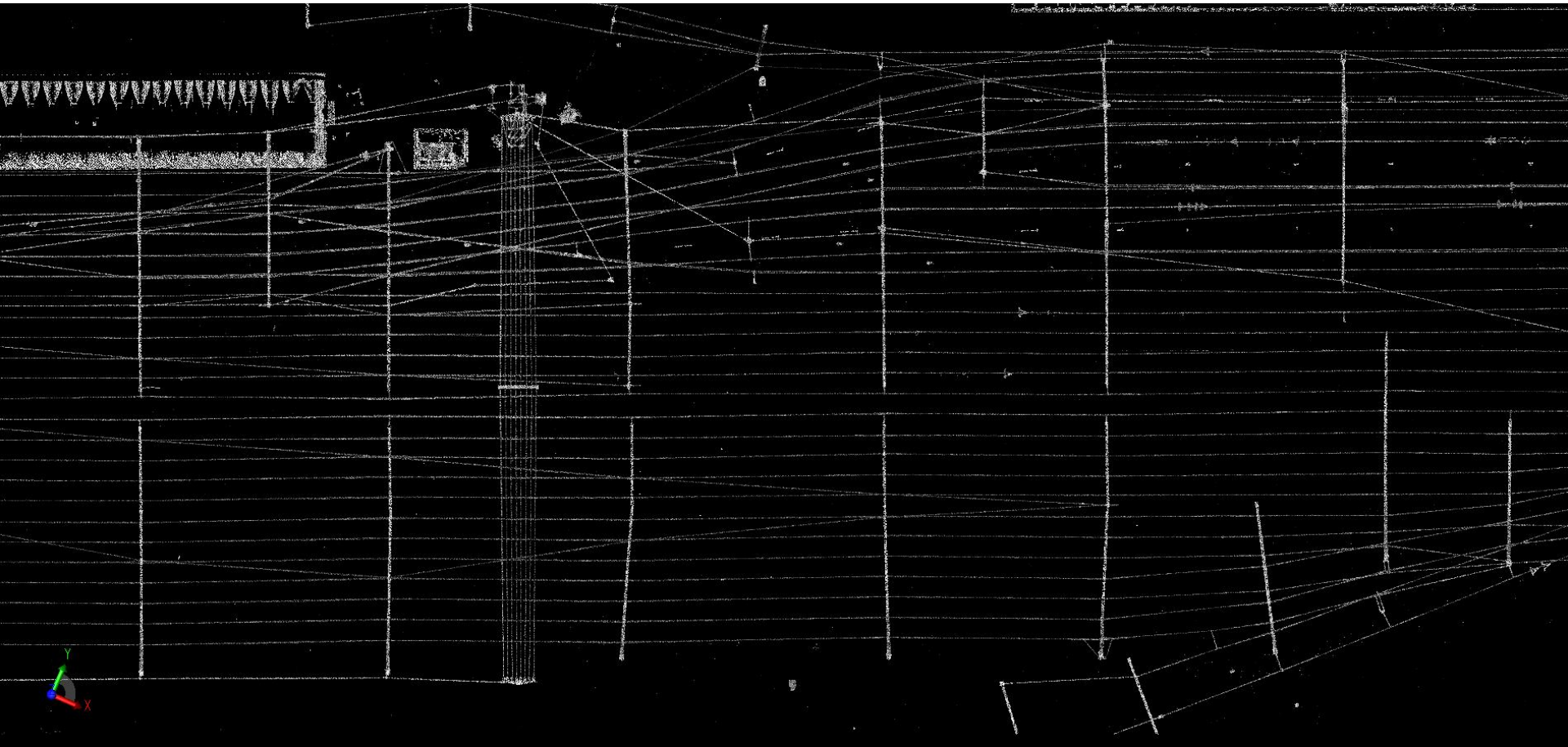
…and data processed



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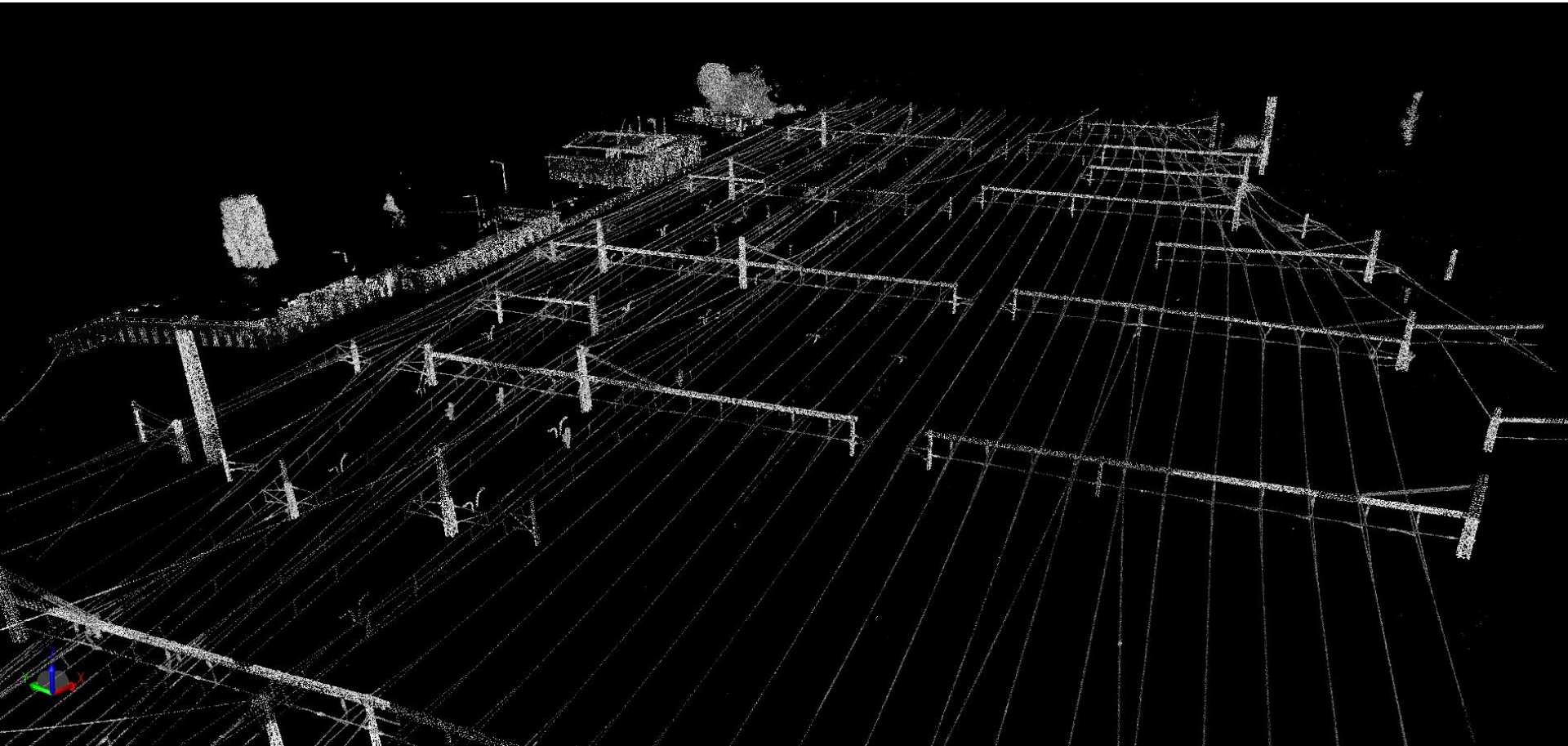

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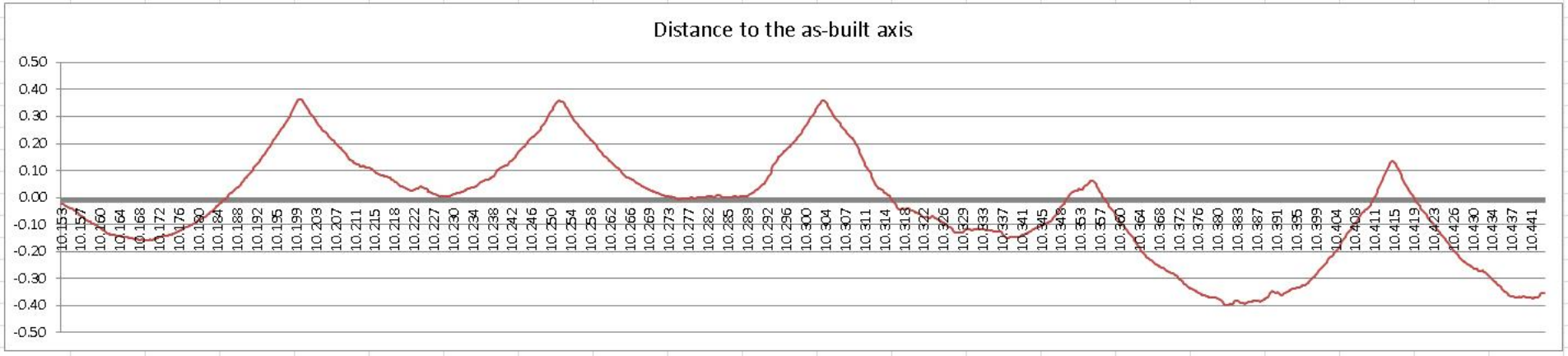
Railway mapping – Overhead cable system

…and data processed



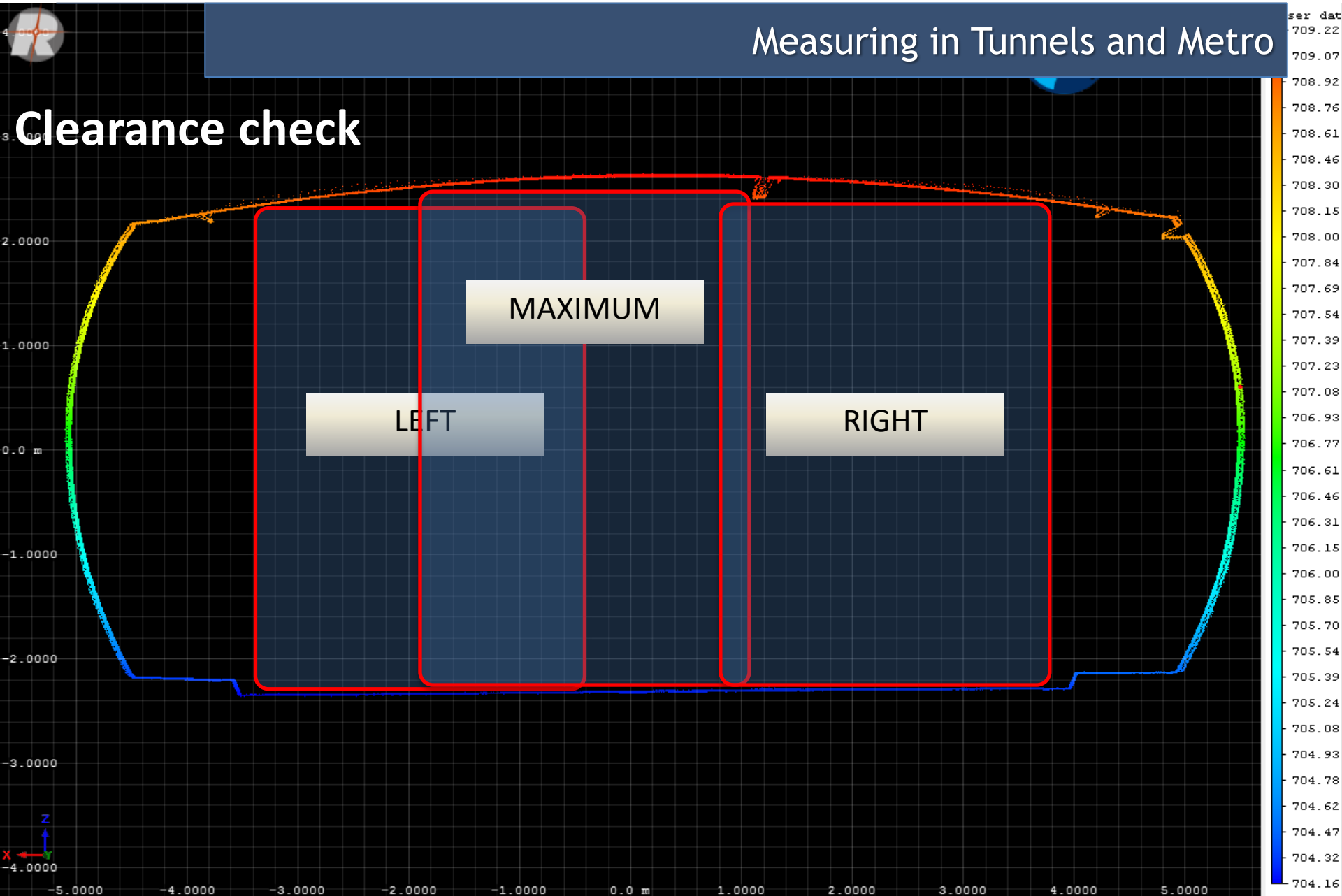
Measuring in Tunnels and Metro

Karawanks Tunnel (7864 m)

Karawanks Tunnel (7864 m)

Karawanks Tunnel (7864 m)

Clearance check



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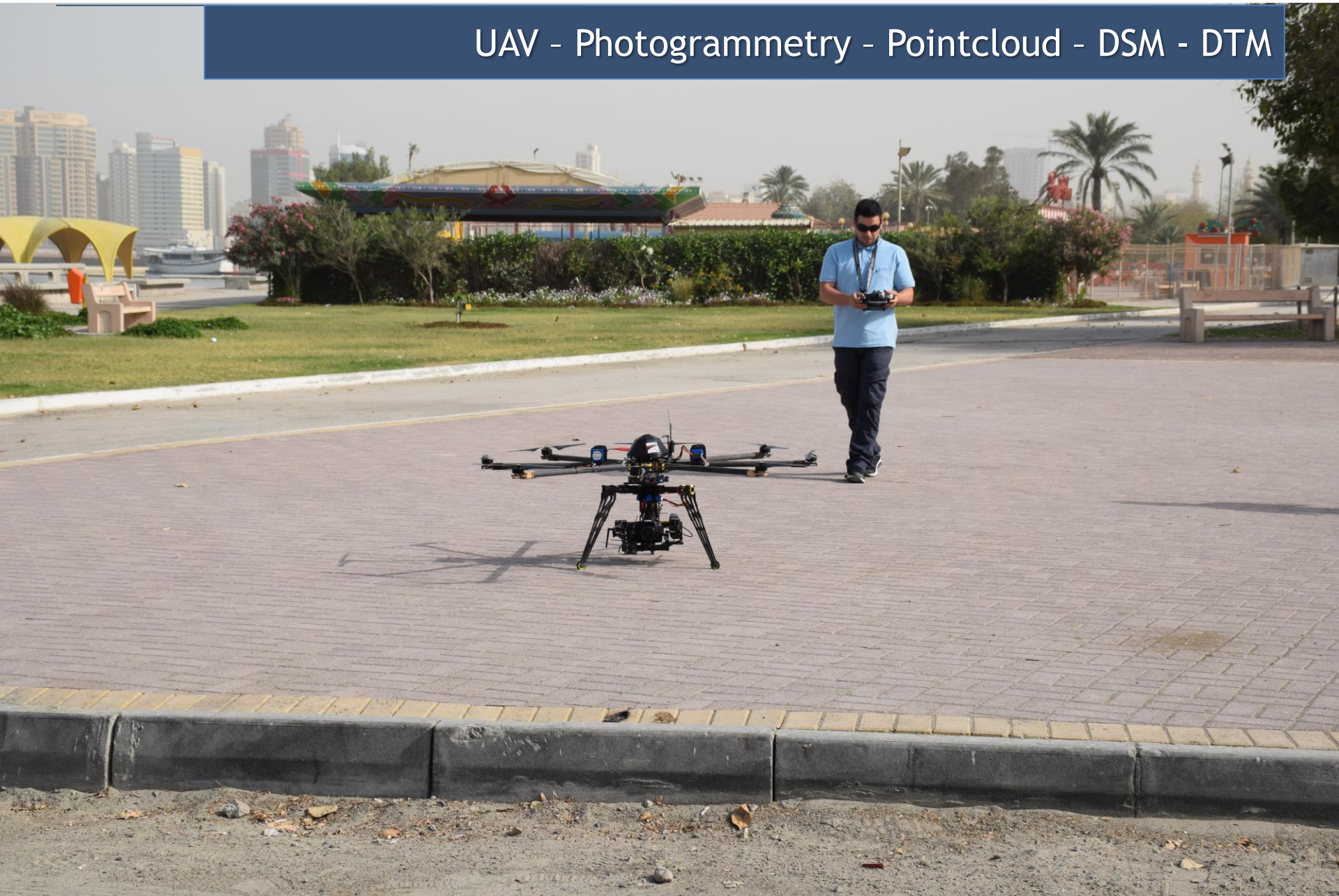
UAV – Photogrammetry – Pointcloud – DSM - DTM



Pointcloud from photo model

Triangle Mesh from Photo model

1 cm ground resolution orthophoto

Conclusion

The 3D point cloud technology can support efficiently even the largest BIM & Smart City projects.

It can provide permanently the most accurate and detailed GIS data from every geographical level with extremely short field work time and improving ROI of BIM projects.

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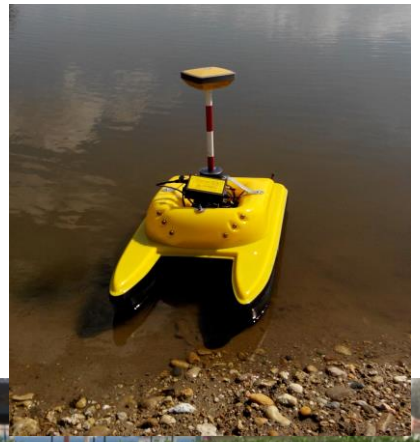
Conclusion

Combination of surveying techniques necessary to cover all demands



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“What you cannot measure,
you cannot improve”

Thank you for your kind attention

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